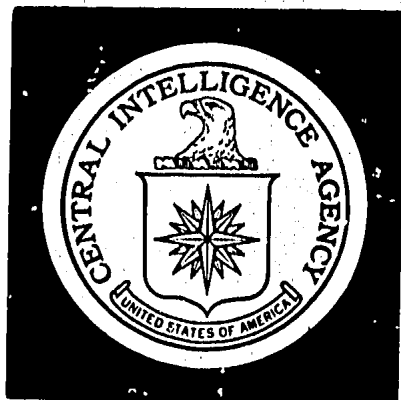


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DIRECTORATE OF
INTELLIGENCE

Intelligence Memorandum

Mozambique's Cabora-Bassa Power Project:

Opportunities And Uncertainties

~~Secret~~

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October 1970

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CENTRAL INTELLIGENCE AGENCY
Directorate of Intelligence
October 1970

INTELLIGENCE MEMORANDUM

Mozambique's Cabora-Bassa Power Project:
Opportunities And Uncertainties

Introduction

After almost 20 years of planning, construction of the Cabora-Bassa power project in northwest Mozambique is now under way. The project is designed to provide abundant and relatively inexpensive electricity in Mozambique and South Africa and eventually to serve as the cornerstone of a plan for the agricultural, mineral, and industrial development of the surrounding region. Militant Black African states, particularly by working through the Organization of African Unity (OAU), have attempted to undermine the arrangements for constructing and financing the dam, and the Mozambique African nationalist organizations have threatened sabotage. This memorandum assesses the possible economic benefits of the Cabora-Bassa project and considers how African efforts to undermine the project may affect these benefits.

Background

1. The Cabora-Bassa hydroelectric project in Mozambique is under construction. Bids for the dam and related facilities were called for by Portugal in 1967 after almost 20 years of planning. Contract talks began in July 1968, and, after

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15 months of negotiations (primarily on financing), a \$308 million contract was signed in September 1969. Originally promoted as a means to accelerate agricultural, industrial, and mineral development in the Zambezi Basin of Mozambique, the emphasis has been shifted to producing electricity, primarily for export to South Africa. An agreement by the Electricity Supply Commission of South Africa (ESCOM) to purchase large blocks of power makes the scheme economically feasible.

2. The dam is being built across the 60-mile-long Cabora-Bassa Gorge on the Zambezi River about 80 miles upstream from the provincial capital of Tete (see Figure 1). Although access is difficult, the narrow gorge provides excellent site features for the arched-wall dam, which will be 984 feet long at the crest and about 550 feet high (see the photograph). Cabora-Bassa will be cheaper and easier

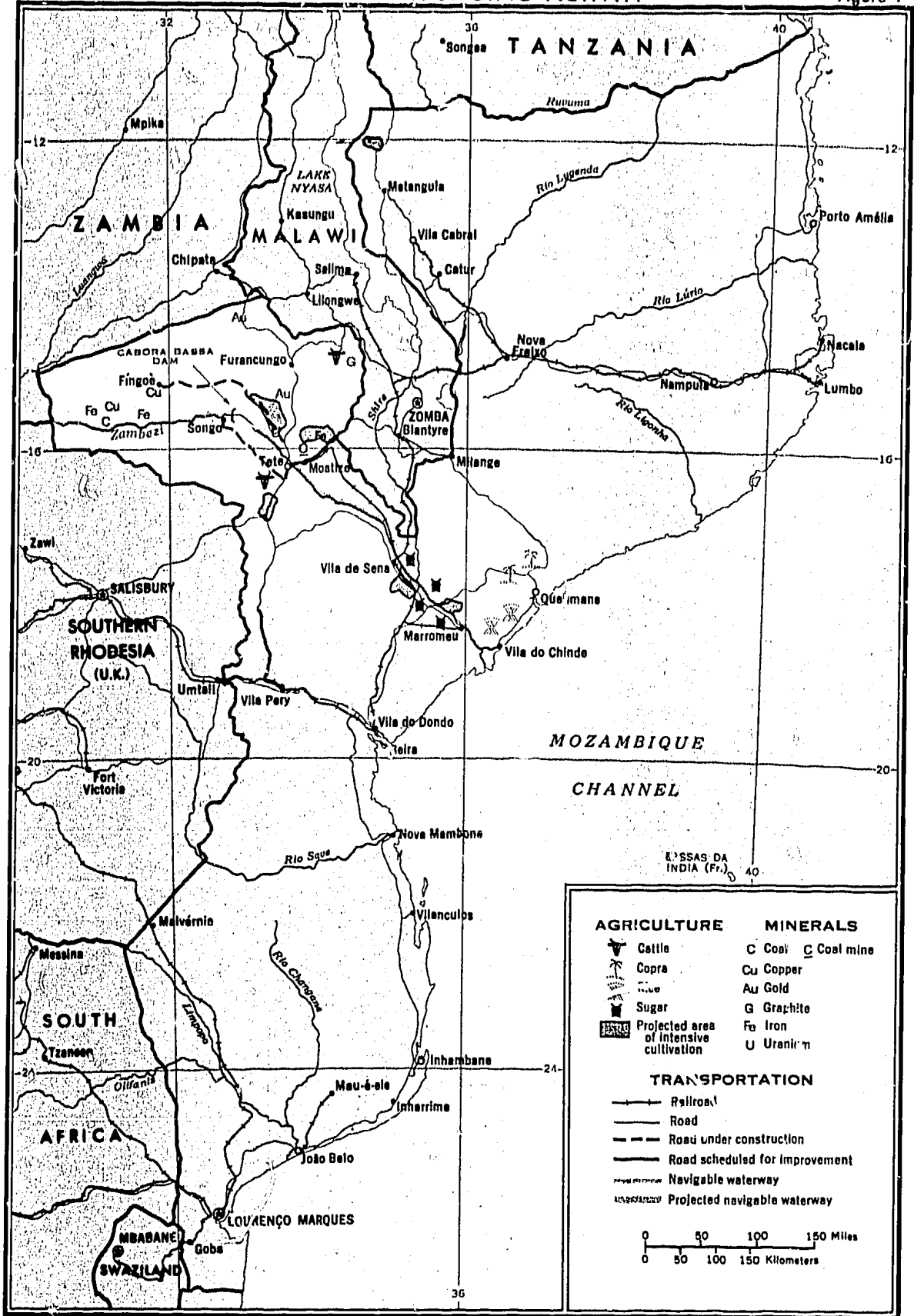


to build than was the Kariba Dam, built further upstream between Rhodesia and Zambia, and it will be only fractionally as massive as the Aswan High Dam. Nevertheless, Cabora-Bassa will control a greater flow of water and eventually could produce more electricity than Kariba and Aswan combined (see Table 1).

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MOZAMBIQUE: ZAMBEZI BASIN - ECONOMIC ACTIVITY

Figure 1



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Table 1

Comparison of Cabora-Bassa and Other Major Hydroelectric Dams

	<u>Physical Characteristics</u>			<u>Hydroelectric Capacity</u>	
	<u>Volume (Thousand Cubic Yards)</u>	<u>Height (Feet)</u>	<u>Crest Length (Feet)</u>	<u>Present (Megawatts)</u>	<u>Ultimate (Megawatts)</u>
Grand Coulee (United States)	10,585	550	4,173	1,975	9,770
Cabora-Bassa (Mozambique)	589	550	984	1,200 <u>a/</u>	4,000
Aswan (United Arab Republic)	56,287	364	11,808	1,750	2,100
Kariba (Rhodesia- Zambia)	1,350	350	2,024	600	1,500

a. Planned capacity of the first stage.

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3. The transmission system includes two parallel 845-mile powerlines, which will link the dam with the Republic of South Africa, and a pair of unique direct current converters -- one at the dam site and one at the South African terminus. A direct current system was chosen because it now is potentially much more efficient than alternating current for transmission over long distances. Cabora-Bassa, however, is the world's first major project in which the system is to be used.

4. The first stage of the project, scheduled for completion in early 1975, will consist of the main dam, a portion of the south bank power facility, and a single transmission line. Capacity will be 1,200 megawatts (mw). The completion of the south bank power facility and a second transmission line in 1979 will increase capacity to 2,000 mw. Eventually, a north bank station, two or three additional small dams, and new transmission lines are planned to be added. These facilities, which are not included in the \$308 million contract, ultimately will increase generating capacity to about 4,000 mw.

5. Cabora-Bassa, however, has become embroiled in political controversy. Both the Portuguese and the Black African nationalist groups trying to overthrow Portuguese rule in Mozambique look on the project as the key to strengthening Portugal's hold on the territory.

6. Lisbon hopes that Cabora-Bassa will lead to substantial industrial and agricultural development in the Zambezi Basin, will attract large-scale white immigration, and thus will provide the financial and manpower resources necessary to entrench the Portuguese in Mozambique. Currently only 180,000 of Mozambique's 7.5 million people are whites, and the bulk of these live in the extreme southern part of the country. Moreover, the economy is poorly developed; ports and railways, which accounted for more than one-fourth of the government's \$206 million in ordinary receipts in 1969, are Mozambique's largest revenue earners. Lisbon envisions that Cabora-Bassa eventually will lure one million new settlers to Mozambique and lead to a dramatic increase in domestic economic production and government revenues.

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7. The Mozambique Liberation Front (Frelimo), the only nationalist group waging guerrilla warfare against the Portuguese in northern Mozambique, and its leading supporters in the OAU fear that the successful implementation of these Portuguese plans for Cabora-Bassa will enable Portugal to perpetuate white rule in Mozambique. They also believe that South Africa will become dependent on Cabora-Bassa electricity, raising the prospects for large-scale South African assistance to the Portuguese to preserve white rule. For example, Frelimo and some of its Black African supporters charge -- albeit erroneously -- that two battalions of South African troops already are defending the dam site.

8. Zambian President Kaunda has been in the forefront of Black African efforts to induce European governments to end participation by Western firms in Cabora-Bassa. Perhaps as a result of these pressures, a Swedish firm withdrew from the project on the pretext that construction would require materials from Rhodesia and consequently would violate Swedish law. More clearly in response to Kaunda representations, the Italian government revoked its intention to provide credit guarantees for the construction of the powerlines. Italian companies, however, are free to invest on their own. Resolutions were passed at the 1970 OAU summit session and the September meeting of the Conference of Non-Aligned States, asking "all states" to refrain from participation in the Cabora-Bassa project. The Non-Aligned Conference also entrusted Kaunda to lead a mission to Western Europe and the United States to urge an end to all Western economic and military ties with southern Africa.

Construction and Financing

9. Despite Black African efforts, foreign participation remains essentially intact. ZAMCO, the consortium that has been awarded the contract for construction of the dam and related hydro-electric facilities, still includes one Italian, one Portuguese, two South African, five German, and nine French firms. The withdrawal of the Swedish firm ASEA, originally included because of

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its experience with a unique direct current mercury arc system, caused some problems. However, Siemens, a German firm that is already a ZAMCO member, is offering a similar but more expensive direct current thyristor system.

10. ZAMCO is obtaining most of the project's financing. [redacted]

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[redacted] French and German banks will provide most of the funds (see Table 2). Although Portugal's and South Africa's direct contributions are relatively small, Lisbon has guaranteed repayment of all loans, and Pretoria is expected to provide up to \$50 million in additional financing in the initial operating period when the cash flow may be inadequate. South Africa probably is refinancing a portion of Portugal's contribution and is also responsible for the financing and construction of the transmission system within South Africa, which is expected to cost about \$80 million (see Figure 2).

11. France and Germany refused to withdraw their credit guarantees for the project, probably because each is unwilling to risk the \$65 million to \$80 million in export sales for the project or their international business reputation -- particularly in South Africa. They have justified their refusal to revoke their earlier commitments by citing the project's potential benefits for the Black Africans. Although Rome has bowed to OAU pressures and has decided not to provide credit guarantees for the construction of the powerlines, Italian participation may be retained if adequate financing can be found elsewhere. South Africa may be willing to underwrite an Italian effort. As construction of the powerlines will not take place for at least three years, the project will not be delayed by ZAMCO's wait-and-see attitude.

12. Although funds for Cabora-Bassa appear to be available, the hesitancy of many Western governments to encourage private Western participation clearly increased the difficulty of financing and raised its cost. Cabora-Bassa is one of the few such projects in less developed countries that is not supported by foreign aid or international loans. Portugal, aware of the political obstacles, has

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Table 2

Cabora-Bassa

Expenditure and Financing Breakdown, by Country a/

	Million US \$
<i>Total expenditure</i>	<i>308.3</i>
Construction	<u>111.9</u> <u>b/</u>
Portugal (including Mozambique)	78
South Africa	17
France	14
Germany	3
Generating and transmission equipment	<u>143.8</u>
Germany	62.1
France	49.8
Country to be determined (probably Germany or Sweden)	16.0
Portugal (including Mozambique)	15.8
Powerline	<u>52.7</u>
Italy	52.7
<i>Total financing</i>	<i>260</i> <u>b/</u> <u>a/</u>
Germany	95
France	95
Portugal	40
South Africa	30

a. Because of rounding, components may not add to the totals shown.

b. Estimate.

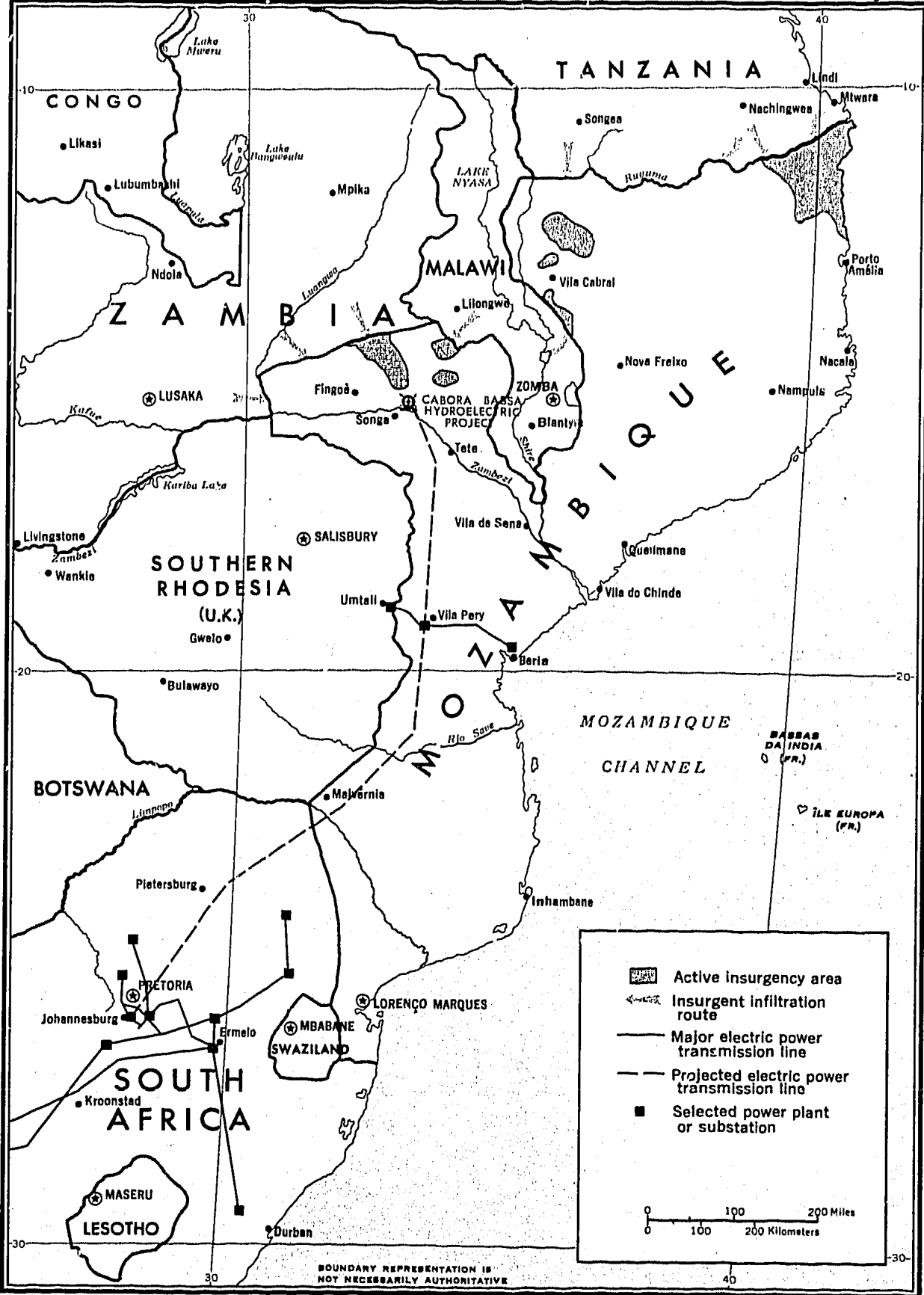
c. Excluding the planned Italian contribution of approximately \$50 million for which the Italian government guarantee has been withdrawn.

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SOUTHERN AFRICA: INSURGENCY THREAT TO CABORA BASSA PROJECT

Figure 2



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not sought such assistance but instead has relied principally on 12-year export credits and a small issue of medium-term notes to Portuguese and South African financial institutions. This unusual financing package with its very short repayment period and relatively high interest rates may pose a strain on the project's financial health, at least in the short run.

Benefits of Cabora-Bassa to Mozambique and Portugal

13. The most direct benefit Mozambique and Portugal will derive from Cabora-Bassa will be the infusion of about \$95 million into their economies. In Mozambique, expenditures probably will total around \$57 million; \$23 million will be for wages -- the consortium having agreed to employ only about 100 foreign personnel each year. In Portugal, construction means about \$15 million for the metalworking industry, about \$5 million for the service sector, and about \$17 million for other sectors.

14. Eventually Mozambique and Portugal also will benefit somewhat from Cabora-Bassa's foreign exchange earnings. Although revenue from the sale of electricity during the first 15 or so years will be used for loan repayments, the facility should, thereafter, earn at least \$25 million annually in foreign exchange. This is not a large figure for Portugal. Because of Portugal's very conservative monetary policy, however, the foreign exchange reserves of the escudo area* now total \$1.3 billion.

15. The greatest potential benefit to Mozambique and Portugal would come through the dam's impact on development in the Zambezi Basin. As the Zambezi Basin development program was conceived originally, about 200,000 acres, principally of

* *Consisting of Portugal and the overseas Portuguese territories including Mozambique, the escudo area has a common currency, a common payments system, a quasi-common market, and a well-integrated credit system.*

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sugar and cotton, were to be irrigated in a first phase and about 70,000 white immigrants settled. Portugal planned eventually to irrigate about 3.7 million acres and settle perhaps almost one million Europeans.

16. The irrigation potential of the project is unlikely to be realized, however. In particular, the Portuguese are unlikely to be able to recruit the necessary number of Europeans -- only about 1,800 *colonos* annually have been attracted to Mozambique during the 1960s despite substantial government incentives. African settlement could be substituted for white settlement -- 24,000 Africans will be displaced by the lake created by the dam -- but irrigation probably would not be justified economically in conjunction with traditional agriculture. A program of African settlement would require a substantial investment in extension services -- an investment the Portuguese government is unlikely to make -- and a period of adaptation before the irrigation system could be exploited efficiently. In any event, Frelimo insurgency north of the Zambezi River has eliminated whatever prospects existed for significant agricultural development in those basin areas where Frelimo becomes active.

17. Although the region's mineral potential is great, the dam and related power facilities may not be adequate inducement to widespread development. Exploiting a 200-million-ton iron ore reserve for an iron and steel mill near Tete has been discussed, but little is known of the ore's metallurgical qualities, and abundant and relatively inexpensive electricity is not necessarily a sufficient reason for selecting a plant site. A variety of other minerals also occur in the Tete district, but only coal is mined at present. Nevertheless, development of minerals may be helped by improvements in the district's infrastructure.

18. The Cabora-Bassa project will improve transport in the Zambezi Basin. The construction itself will require building 106 miles of paved road from the Moatize railhead. Regularizing the river's flow will improve navigation over a

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186-mile stretch in the lower course, which now is navigable as far as Tete in high water periods, although for less than 100 miles at low water. Silting limits the use of the delta port of Chinde, but dredging a 5-mile channel capable of taking 40,000-ton vessels to a new port at Cuama is planned. These improvements could provide a stimulus to regional growth if the security of the transport system from sabotage can be assured.

Benefits of Cabora-Bassa to South Africa

19. Most of Cabora-Bassa's electricity will be sold to South Africa. Two transmission lines, located about one mile apart, will link the dam's generators with South Africa's main power grid, which is centered in the Johannesburg-Pretoria-Ermilc triangle. A single line with an 800-mw capacity is scheduled for completion in 1975. The second line, which will increase transmission capacity to about 1,750 mw, will be completed in 1979. The system is designed so that if one line is out of commission the other temporarily could carry the full load.

20. The South Africans are likely to buy about 7.5 billion kilowatt-hours (kw-hr) of Cabora-Bassa electricity in 1980, which would provide about 8% of the Republic's total requirements.

21. Although South African electricity costs have been relatively low because of the availability of some of the world's cheapest coal, Cabora-Bassa electricity will be competitive. During the project's first 21 years, electricity from Cabora-Bassa will be available at the South African power grid at a cost of about 0.5¢ (US) per kw-hr, roughly equivalent to the present average delivered cost from other sources. After 21 years, when project costs have been amortized, the delivered price will decline to the relatively low figure of about 0.3¢ (US) per kw-hr. Although the new larger thermal power stations now being constructed in South Africa are more efficient than those presently in use, higher capital costs and the need to employ more costly techniques that reduce water requirements will prevent a major reduction in their total costs.

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22. The economic benefit that South Africa could derive from Cabora-Bassa appears to be reduced by the Frelimo threat. The transmission lines from the dam, which run for more than 500 miles through Mozambique, are vulnerable to sabotage, although Frelimo apparently will be active only near the northern terminus of the line for the foreseeable future. To guard against possible power interruptions caused by such attacks, South Africa intends to maintain standby electric power reserves with a capacity equal almost to that of Cabora-Bassa. ESCOM is seeking to increase its installed capacity sufficiently so that by 1980 peak load reserve capacity, which now is probably less than 10% in the main interconnected system, will have reached 16%. Because about half that reserve is normally under maintenance and repair, the genuine reserve will be equal to about 8% of system capacity, or about equal to the capacity of the transmission system from Cabora-Bassa. ESCOM will be reimbursed for the cost of maintaining the additional reserves by the South African government, which will in turn be repaid by ESCOM from the savings from Cabora-Bassa's lower power costs after 21 years.

23. Although South African economic benefits from Cabora-Bassa may not be substantial, Pretoria should derive long-range political advantages. The project is in keeping with Pretoria's policies of increasing its collaboration with other white-ruled states of southern Africa. With Pretoria's participation, the project becomes a symbol of Portuguese - South African cooperation and increases their economic ties. South Africa also will stand to gain from any eventual economic development and white settlement generated by Cabora-Bassa, because an increase in the white Portuguese presence in Mozambique would boost the Lisbon government's stake in continued Portuguese rule in Africa.

Benefits of Cabora-Bassa to Malawi and Rhodesia

24. Rhodesia and Malawi could benefit from the availability of abundant and relatively inexpensive electricity at Cabora-Bassa because it is unlikely that all the electricity that can be produced at

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the dam will be utilized within Mozambique or exported to South Africa. If electricity were made available in Malawi at a cost of less than 0.35¢ (US) per kw-hr, a proposed aluminum smelter in Malawi might be economically feasible. The aluminum smelter would be able to use up to 2 billion kw-hr of Cabora-Bassa electricity annually. This quantity would be about 17% of total output in 1979. Although Rhodesia has adequate internal sources of electricity for the foreseeable future, Cabora-Bassa, only 200 miles from Salisbury, is in a good position to meet any additional future demand, particularly in the northeastern area of the country where large deposits of a wide variety of minerals are believed to exist.

25. Rhodesia and Malawi will benefit immediately from the Cabora-Bassa construction itself. Rhodesia will supply some steel and cement as well as some consumables employed in the construction or required by the staff. The total value of these sales is unknown, but Rhodesia probably has provided at least a \$1.4 million credit to the Portuguese to facilitate the transaction. Malawi, although providing little for the construction, will, like Rhodesia, benefit from the improvements in infrastructure. The completion of a bridge across the mile-wide Zambezi near Tete will benefit road traffic between Malawi and both Mozambique and Rhodesia.

Cabora-Bassa and Frelimo

26. Cabora-Bassa is economically viable at the present level of insurgency. The long-term benefits which the Mozambican and South African economies will realize from the Cabora-Bassa project depend in part, however, on the extent of the Frelimo threat. If the Frelimo threat could be reduced substantially or eliminated, the Cabora-Bassa project would become much more worthwhile to both Mozambique and South Africa.

27. Portuguese counterinsurgency efforts are likely to contain Frelimo activity to harassment raids near the northern border. Such raids are unlikely to endanger the project itself. On the other hand, Frelimo seems likely to maintain some

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sabotage capability and is likely to mine roads and perhaps attack isolated supply columns going to and from the site. If the level of harassment and sabotage becomes burdensome, the Portuguese probably would be willing also to retaliate with cross-border raids and sabotage of their own. Border incidents caused both by guerrillas and Portuguese counter-insurgency operations have already helped to sour Portuguese-Zambian relations. Moreover, a dozen or so acts of sabotage have occurred in Zambia within the last few years, primarily involving damage to bridges, powerlines, pipelines, and fuel storage facilities. The Portuguese may have been responsible for one or two of these incidents. To reduce the risk of retaliatory action from neighboring white-ruled states, Zambia currently imposes certain restrictions on guerrillas utilizing Zambian sanctuaries, and it is not clear how much freedom the Zambian government would give Frelimo in the face of strong Portuguese counter-pressure. In any event, the project is economically viable at the present level of insurgency.

Conclusions

28. Work on a long-planned hydroelectric project is under way at Cabora-Bassa on the Zambezi River in Mozambique. Construction of the first stages, with a planned generating capacity of 2,000 mw, is being undertaken by a consortium of European and South African firms and should be completed in 1979. The first stage, to be completed in 1975, will have a capacity of 1,200 mw. Despite OAU efforts to undermine the financial arrangements for the \$308 million project, funds secured primarily from French and German banks appear to be available.

29. The dam's construction will benefit Mozambique, Portugal, and South Africa. A total of about \$95 million will be spent in the Mozambican and Portuguese economies during construction, and the foreign exchange inflow will be about \$25 million annually. Most of the electricity to be generated at the dam is to be transmitted to South Africa, where it initially will be available at prices comparable with the

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cost of electricity from other sources and after 21 years will be available at a savings of approximately 40%. Eventually some agricultural and mining development, particularly in Mozambique, is likely to follow.

30. The full potential of Cabora-Bassa will not be realized. Cabora-Bassa is unlikely to fill its original role as the cornerstone of a program of agricultural and mineral development in the Zambezi Basin, because of the difficulty of acquiring an adequate number of white settlers and the initiation in the region of guerrilla warfare. The benefit of inexpensive electricity for South Africa will be reduced, moreover, by South Africa's need to maintain additional standby electric reserves.

31. Politically, the project, even if only marginally successful, will strengthen Lisbon's determination to remain in Mozambique. Pretoria will gain from bolstering the Portuguese presence in Mozambique by reducing the possibility that South Africa may have to contend with a hostile Black African state along its eastern border. The extent of these political gains will be influenced by the degree of white immigration and agricultural and mining development that eventually takes place.

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